ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION:	Trent 1000-M3	BYPASS RATIO (-):	8.9
UNIQUE ID NUMBER:	02P23RR134	PRESSURE RATIO π_{oo} (-):	48.8
COMBUSTOR:	Phase5 Tiled		
ENGINE TYPE:	TF	RATED OUTPUT F_{oo} (kN):	358.1

REGULATORY DATA

CHARACTERISTIC VALUES:	LTO_{mass}/F_{oo} (mg/kN)	LTO_{num}/F_{oo} (particles/kN)	NVPM MASS CONCENTRATION ($\mu g/m^3$)
LTO/F_{oo} AND MAX $nvPM_{mass}$	178.0	1.65E+15	3410
AS % OF CAEP/10 LIMIT	-	-	89.9
AS % OF CAEP/11 LIMIT (InP)	51.2	39.5	
AS % OF CAEP/11 LIMIT (NT)	83.2	59.2	

MEASURED DATA

MODE	POWER SETTING ($\%F_{oo}$)	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES* EI_{mass} (mg/kg)	EMISSIONS INDICES* EI_{num} (particles/kg)	NVPM MASS CONCENTRATION PEAK $nvPM_{mass}$ ($\mu g/m^3$)
TAKE-OFF	100	0.7	2.802	41.0	1.04E+14	
CLIMB OUT	85	2.2	2.274	61.2	1.95E+14	
APPROACH	30	4.0	0.732	82.9	8.91E+14	
IDLE	7	26.0	0.267	19.4	4.72E+14	
LTO TOTAL (kg, mg, number of particles)			1010	45841	4.24E+17	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/F_{oo} VALUES (mg/kN, particles/kN)				128.0	1.18E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC.($\mu g/m^3$)				153.9	9.32E+14	2649

** Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content*

DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING ($\%F_{oo}$)	CORRECTED EMISSIONS INDICES EI_{mass_SL} (mg/kg)	CORRECTED EMISSIONS INDICES EI_{num_SL} (particles/kg)
TAKE-OFF	100	43.8	1.41E+14
CLIMB OUT	85	65.9	2.70E+14
APPROACH	30	95.2	1.97E+15
IDLE	7	23.3	9.28E+14

AMBIENT CONDITIONS

	From	To
BAROMETER (kPa)	100.8	101.6
TEMPERATURE (K)	287.0	292.6
HUMIDITY (kg water/kg dry air)	0.0080	0.0090

FUEL

HEAT OF COMBUSTION (MJ/kg)	43.34
HYDROGEN CONTENT (%mass)	13.97
AROMATICS CONTENT (%vol)	15.9
NAPHTHALENE CONTENT(%vol)	0.11
SULPHUR CONTENT (ppm by mass)	300

MANUFACTURER:	Rolls-Royce plc
TEST ORGANIZATION:	Rolls-Royce plc
TEST LOCATION:	Derby
TEST DATES:	04/10/2018

REMARKS

1. Certification Report EDNS01000740804
2. Correction of minor error in reported nvPM data
3. The maximum EImass occurs between 30% and 85% Foo
4. The maximum EInum occurs between 30% and 85% Foo
5. Corrected peak EI number value (fuel correction) since EEDB v30